agriculture

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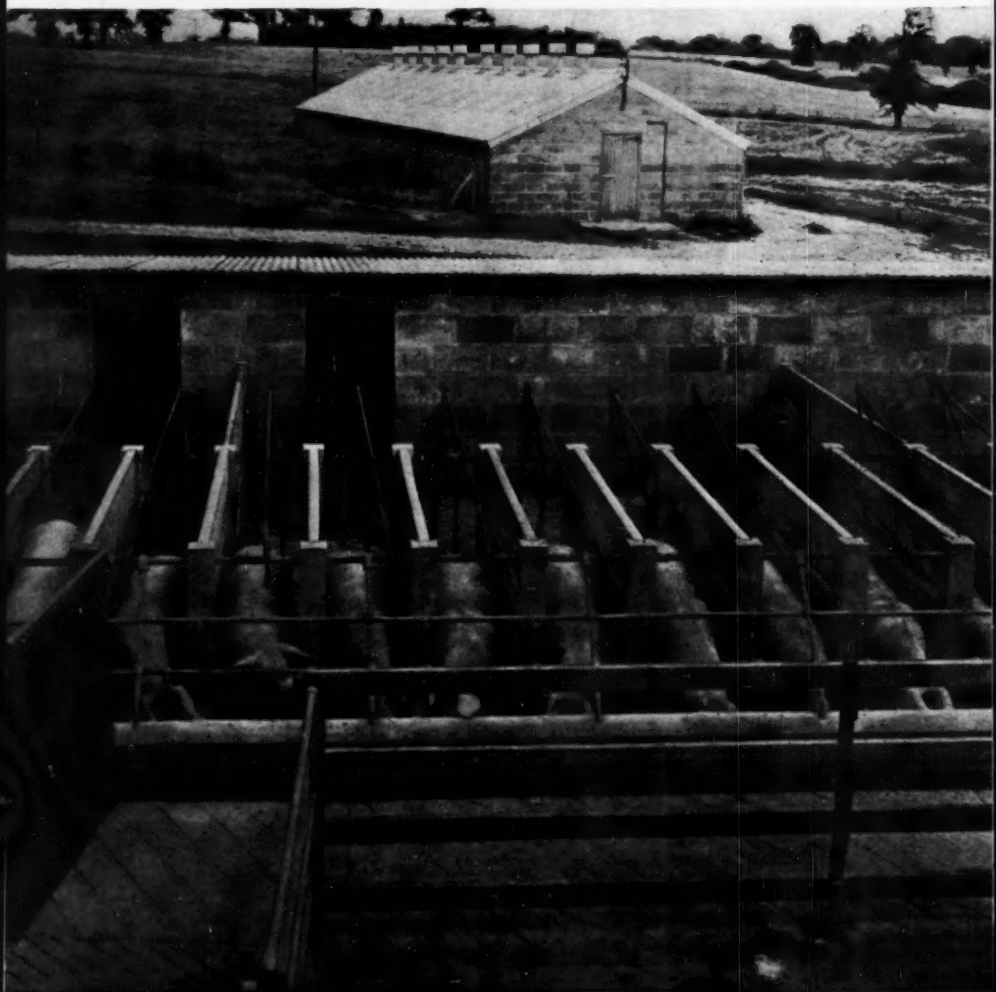

Pig Housing

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Editorial Offices
Ministry of Agriculture, Fisheries and Food
Tolcarne Drive
Pinner
Middlesex HA5 2DT 01-868 7161

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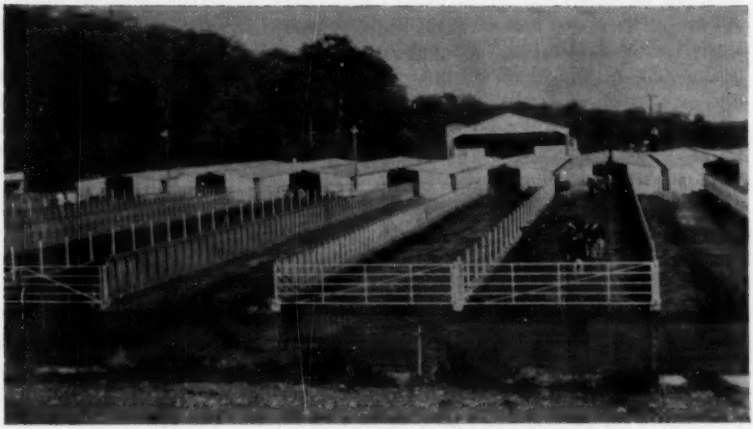


Feeding area and kennels with dairy and parlour at rear

The Nettlebed Project

—a Dairy Herd Unit of 500 cows

R. B. Sayce

TODAY a dairy unit of 500 cows is not unique but a few years ago the concept seemed Wellsian. Enough such herds have been set up to enable studies to be made which will produce guidelines for the establishment of large herds in the future. Most such units were planned and started in the glare of publicity but one was not. The Nettlebed Project is a private venture, a commercial unit planned and run for the benefit of an estate of 2,500 acres, including 1,000 acres of woodland. Colonel Peter Fleming, the owner, has said 'the Dairy Unit representes an attempt to pioneer, or rather to join the pioneers, in a field which looks like becoming important for British agriculture. It also, of course, aims at giving the Estate sufficient economic buoyancy to face the hazards of the future and even (with luck) to survive the impact of Death Duties'.

Planning

In 1966, 700 acres of the land held by the Nettlebed Estate was farmed with cereals and a 70-cow bail-milked herd. The chalk and clay-with-flints land, interspersed with woods, really needed a livestock policy if profits were to be better than very moderate. Following a visit by the Estate Manager, Dennis Warren, to the U.S.A. on a Winston Churchill Trust Fellowship,

plans were prepared for a herd of 500 cows. The planning of a project of this size is complex: it involves determining husbandry policies and operations, financial implications, labour requirements and capital works involvement. All are inter-related and all seem to demand first priority. But the planning started with certain basic assumptions: first, that the herd was to be kept as one unit; second, that zero-grazing was necessary; third, that new methods and new routines for milking must be devised; and finally, that effluent disposal should be water-borne, provided a supply of water could be assured. Of these the key factor is probably the milking parlour and its routine. This has to provide efficient fast milking with the least number of milkers, yet allow for adequate cow identification to enable good stockmanship to be practised.

The milking unit

The result is a twelve-unit, twelve-standing parlour, one man operated, used in two shifts by two milkers. The system is low level with recording jars under the standings. The operator's pit is at the same level as the dairy floor. Assembly yards, standing and dispersal yards are sloped from 2 ft 6 in. above the pit and dairy floor down to the access passage to the kennels. Parlour, dairy, office, collection and dispersal yards are in one framed building 112 ft long by 45 ft wide. This design is relatively cheap in capital outlay; the gross capital cost, including parlour and dairy equipment, food store and services, was £42 per cow place. It gives congenial working conditions, provides for easy cleaning by hosing down, and enables the herd to be handled in strings of sixty-six. The efficiency of milking is governed by routine and this is 'round' rather than 'across' the parlour. A throughput of over 100 cows per hour is possible if required, and each milker milks the same 250 cows (his 'herd') each day. Concentrates are fed from 3¼ cwt hoppers automatically filled from two outside free-standing silos with automatic weighing. The dairy has provision for four bulk tanks with a total capacity of 2,160 gallons. To facilitate management, milk production and food consumption are shown on display counters in the dairy.

With this design of parlour adopted, it is possible to arrange in groups of sixty-six cows to simplify traffic flows. The cows are housed in kennels in pairs of facing rows, each row housing thirty-three cows. Eight such pairs gives accommodation for 528 cows. Between the rows are access passages leading to the feeding areas, each of which is flanked on one side by a bank of sixty-six yokes and on the other side by a feeding passage for a side-delivery trailer. This arrangement enables fresh grass to be fed in the summer and cut silage from three bunker silos holding 2,500 tons of cereal and grass silage in the winter. For calving cows, fifteen loose boxes with a stockmen's store are provided, and a store 150 ft long by 33 ft wide is close by to hold purchased brewers' grains.

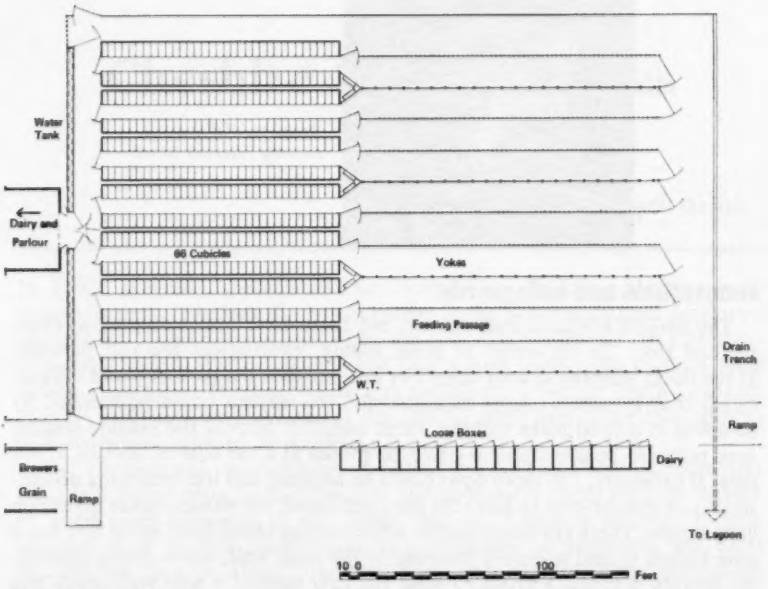
Zero-grazing

Zero-grazing was adopted because of the physical difficulties of 500 cows gaining access to grazing. As some of the fields adjacent to the unit are surrounded by woods on three sides, unacceptable walking distances for cows would be involved and it was considered more practical, realistic and economic to take the water and grass to the cows rather than to drive them over the estate roads.

Water supply

Production of grass in sufficient quantity depends on irrigation, and the design allows for irrigation of eight acres at 1 in. per acre every day over 153 acres. Effluent disposal is also water-borne.

To achieve these ends a reliable and ample supply of water is vital. The source is a 12 in. bore hole, 465 ft into the chalk strata with extraction by submersible pump with a capacity of 7,500 gallons per hour. The total daily consumption at the dairy unit at peak production is estimated at 47,000 gallons. Flood washing tanks holding about 15,000 gallons are sited at the upper end of the kennels. To clean the kennel access passages and the feeding areas, water is released as a tidal wave through specially designed sluice gates; it flows into the drain trench at the end and from there into a lagoon system. The original single lagoon proved inadequate and there are now five settlement ponds. From these the effluent is discharged into a 5 million gallon reservoir, which can also be filled direct and which supplies the irrigation system.



Plan of dairy herd unit

Objectives and costs

The unit was not developed without the setting of objectives and targets or without budget planning. In 1967, the aim was to increase the existing dairy herd of 70 to 500 cows by 31st December 1970. At this time the herd would still be young, having been built up by purchase of in-calf Friesian heifers. By the end of 1972 the target is to have 270 old cows producing 900 gallons each, 190 third calvers producing 800 gallons each, and the balance heifers and second calvers. Targets for each year of development were set and the labour force now comprises a manager, three tractor drivers,

three milkers, two feeders and a stockman. The total capital expenditure incurred per cow, net of grant, has been £112 8*s*, £74 8*s*. for the whole dairy herd unit and £38 for the water supply and irrigation. This is a cost of about £75 per acre. The forward budget planning anticipated net margin losses in the first three years, 1967-69, but thereafter positive net margins rising to £24,280 in 1972: the net cash flows discounted over a ten year period were estimated to give an effective rate of return of 17·5 per cent. This is, however, based on a new enterprise, not on marginal capital and profits from the existing herd. Results so far show that the project did not quite achieve the targets in the first year, but is up to the forecast levels for 1970. A fairer judgment can be made only when the unit is in full production.

Aerial view of unit showing reservoir at top

Innovations and safeguards

The project contains innovations, but these have been accepted as commercial risks. In the event of some failing, alternatives are still possible. If the flood washing system turns out unsuccessful (in spite of some difficulties it is at present working satisfactorily) the effluent could be handled by scraping in a solid form without water addition. Should the outside feeding area prove to be unsuitable it could be roofed at a net cost of about £20 per cow. If necessary, 250 dairy cows could be retained and the remaining accommodation turned over to beef. On the other hand, the design makes extension very simple. There are many simple labour saving ideas. Each loose box has a gate hinged to and normally fastened to the back wall; when swung through 90 degrees it forms a crush to hold the cow against a side wall; each box has a vacuum line for use by the stockman with a bucket milking plant. Sluices operating the flood tanks are controlled by a single lever and are designed to enable an exact amount of water to be released. The side-delivery fresh grass trailers are adapted from a muck spreader design. Herd control by the two cowmen is by a display board with vertical cursor. These devices have developed from a realistic and logical approach to planning which is refreshing in these days of management techniques.

Although still in the development stage, the project demonstrates the value of planning by objectives and the use of simple control techniques.

The author of this article, **R. B. Sayce, F.R.I.C.S., F.L.A.S.,** is the Ministry's Divisional Land Commissioner at Oxford.

Pastures ploughed for potatoes

Cheshire Early Potatoes

Haydn Davies

IT IS not generally appreciated that North Cheshire has a thriving early potato industry. The industry has its origins in the last century, and developed in response to the demand created by the urbanization of adjoining Merseyside and Lancashire. It is remembered locally with some pride that the early potato industry of Pembrokeshire was started by a former north Cheshire grower; and that Cheshire farmers also had no mean part in the development of early potato growing in Anglesey.

The phenomenal development of potato growing in Pembrokeshire was initially a severe blow to the Cheshire industry, particularly with the advent of good road transport in the 1930s. But the Cheshire industry rapidly adapted itself to this competition by specializing in supplying the local demand for new potatoes after the short-lived Pembrokeshire harvesting season. Since the introduction of the variety Ulster Prince in the late '40s, it has also specialized in growing large-sized new season potatoes for the large fish and chip frying interests of Merseyside and Lancashire.

Varieties

Ulster Prince is by far the most popular variety, taking up about 2,100 of the 3,237 acres of early potatoes grown in 1969. It is favoured because:

it produces a large reasonably clean kidney-shaped tuber, making it well suited to the production of an early season chipping sample;

the tubers have shallow eyes, a thin skin and freedom from cracking and other defects, so minimizing consumer waste;

it is relatively slow sprouting: this is regarded as an advantage in that boxed seed (even of the earlier sprouting 'once-grown' seed) can be adequately chitted in the existing cowshed lofts without elaborate temperature control and lighting arrangements;

it has good varietal resistance to aphid-borne virus diseases: this is important as great emphasis is placed on the use of acclimatized home-grown seed for enhanced earliness of bulking.

Because of the protracted harvesting season from early June to late August, other varieties have to be grown to ensure a continuity of crops for lifting. For pre-Ulster Prince liftings (up to the end of June) the earliest bulking varieties Homeguard, Ulster Chieftain, Ulster Premier and Ulster Sceptre are used. The produce of these is used largely for the normal ware as opposed to the chipping trade. For liftings after the Ulster Prince in about mid-August, small acreages of the second early variety Criag Royal are grown.

The fairly recently introduced variety Ulster Sceptre is perhaps worthy of special mention. Although of similar parentage to Ulster Prince, it is in most seasons about ten days earlier in bulking to a marketable sample. Locally conducted N.I.A.B./N.A.A.S. first early variety trials have also indicated that Ulster Sceptre has a worthwhile yield advantage over Ulster Prince, although the advantage does tend to decline from early July onwards. Severe post-planting frosts can reduce this earliness of bulking.

In spite of this, Ulster Sceptre has not superseded Ulster Prince to any significant extent. This is largely due to the fact that, in having more tubers per plant, Ulster Sceptre yields a poorer chipping sample. There is, however, some interest being shown in trying to get Ulster Sceptre to yield a better chipping sample by a combination of using smaller 'once-grown' seed and encouraging the maximum number of once-grown seed tubers with single or at most two sprouts. A small scale observational investigation is in progress this season to gain more information.

Rotation

Most farms where potatoes are grown have dairy herds run on intensively managed pastures. These pastures when ploughed out for potatoes have the very valuable asset of providing well structured, fibrous, weed-free soil. Since holdings are relatively small (50 to 90 acres being the usual range) and compactly laid out, the potatoes and cows can be taken around all or most of the farm acreage. This gives a sound rotational cropping policy for early potatoes of one potato crop every three or four years or, as is more commonly the case, two consecutive crops in six or seven years with a maximum of two consecutive crops in five years on the very earliest fields. Any significant departure from such cropping patterns may lead to a rapid and serious build-up of potato cyst eelworm.

Growing the crop

The cultural husbandry of growing the crop is standardized within the area and, in essence, is similar to that of other early potato districts of Britain.

In contrast with most other districts, however, weed control with residual soil acting herbicides has not been widely adopted even though labour shortage is a feature on most farms. The main reason for this is that most

soils are remarkably weed-free after three to seven years of grassland so that only one, or at most two, very shallow inter-row cultivations are required for effective weed control. Such shallow cultivations cause little or no root damage whilst any resulting moisture loss is of little consequence in this atmospherically humid locality. There is also the advantage that any surface panning of the soil is destroyed, so ensuring adequate soil aeration and full penetration of the drill by rain. Susceptibility to frost damage may be marginally increased but this is felt to be of little consequence for a naturally frost resistant variety such as Ulster Prince.

Also, in contrast to other districts, little benefit seems to have been derived from using the high phosphate 1:2:1 type fertilizer compounds that are generally recommended for early potato production. In consequence, almost all farmers use the 1:1:1½ type compound recommended for the maincrop. Potatoes for lifting up to the end of June receive about 120 units N, 120 units P and 180 units K, whereas crops for lifting after this period receive about 140 units of both N and P and 210 units K. Invariably the fertilizer is applied by a drill placement machine and these levels apply to placed fertilizer. In addition almost all crops receive a 15–20 ton dressing of farmyard manure per acre.

There is a small trend away from drill placement towards broadcasting of fertilizer. This is perhaps more noticeable on the larger farms where speed of work becomes of over-riding importance. Where soil P and K levels are high (index value 2 and above) it is generally felt that the advantages of placement are somewhat reduced. Since most of the potato fields in the locality have been heavily fertilized and farmyard manured for the last twenty-five years or so, they actually have soil P and K values of index 2 or above. This high soil phosphate reserve could also possibly explain the general lack of response to the high phosphate 1:2:1 type compounds.

Because of the serious mechanical difficulty of satisfactorily handling forward chitted seed, very few farmers have abandoned their often antiquated but well tried and often cherished hand operated planters in favour of the new automatic planters.

Hand planting seed potatoes

Home grown seed

Great reliance is put upon using 'once-grown' and 'twice-grown' seed. Such seed not only has enhanced earliness of bulking but it is also considerably cheaper than certified seed. (Certified seed of Ulster Prince generally

costs £47 to £58 per ton depending on season and certificate, whereas home grown seed is valued at sale realization value of £15 to £20 per ton. When planted at 30–40 cwt per acre this, of course, represents a considerable saving). About 10 per cent of the total acreage is devoted to seed production every year; therefore for the average 20 acres grown, 1½–2 acres are devoted to seed production.

The production of once-grown seed relatively free from virus infection presents the grower with what is probably his most difficult problem. Adequate geographical isolation of the seed-producing crop from the once-grown and twice-grown seeded ware-producing crops is almost impossible in this fairly highly potato cultivated, low altitude, high-aphid population area.

Virus disease spread, however, is being actively combated by the fairly widespread use of granular insecticides applied to the soil of the seed-producing crop at planting time. This is often supplemented in late June by an aerial application of a systematic insecticide to all potato crops, invariably in combination with a blight-preventing fungicide. Unfortunately such measures are of little use in controlling rugose mosaic as this virus disease can be transmitted by an aphid in the period between the aphid taking up the chemical and its eventual death. This is particularly worrying since the second most popular variety, Ulster Sceptre, has very low varietal resistance to rugose mosaic. Fortunately Ulster Prince has reasonably good varietal resistance to the disease.

Virus disease build-up in the seed stock is also minimized by the removal of the foliage immediately upon the attainment of a full seed crop, usually in mid-July. Removal by dessicating with a chemical is preferred to mechanically 'bashing' off the tops since not only does it give a more certain kill of the lush actively growing foliage, but it also minimizes regrowth. Dinoseb in oil is the chemical most commonly used. After burning off, the seed is left in the soil for about three weeks to allow the skins to harden and so reduce damage at harvesting.

Early burning off is also highly advantageous in that it gives the desired 'soft' immature seed, thus enhancing the likelihood of early growth and bulking in the following season. The more discerning growers have observed that this earliness of growth advantage of immature seed is more apparent in seed from crops where the haulms have been killed by chemical dessication than by mechanical means.

Marketing and pricing arrangements

The methods of marketing, and in particular of price fixing, are probably unique to the north Cheshire trade. During the period early June to late August, each grower lifts almost daily and these fresh dug potatoes are collected by the merchants on the late afternoon of the day of lifting for direct delivery, either that day or the following morning, to the shops and fish fryers.

Recommended ex-farm prices are fixed throughout the four-month period by a small potato exchange (the Appleton Thorn Potato Exchange), composed of representatives of local growers and merchants. It meets on three afternoons each week in the high season (later twice and by the end of August once a week) and helps to arrange not only reasonably fair but also stable prices. Prices are kept stable; even in a heavy glut period on a pro-

nounced buyers' market many merchants honour the price recommended by exchange. The fact that many growers have dealt with the same merchants for over thirty years or more says much for both the pricing system and the goodwill that has been built up between grower and merchant.

The future

It is somewhat ironic that the urbanization of Merseyside, which was the stimulus for the origin as well as the successful growth of the industry, is now casting on it an ominous shadow. Before long a large section of some of the earliest and very best early potato land will be lost to encroaching urban development.

The author, **Haydn Davies, M.Sc.,** is a District Agricultural Adviser for the N.A.A.S. in Cheshire.

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Burning of Gorse

The burning of gorse is a regular and necessary practice on many farms. To minimize the risk to birds and other wild life and to property, farmers who plan to burn gorse are urged to do so between now and next March. Burning should be completed before the end of March so as to avoid the nesting season.

Proper precautions should of course be taken. Enough people should be present throughout the entire operation, adequately equipped with 'beaters' such as wet sacks, shovels or spades, to control the burning and prevent damage to adjacent land, especially forestry plantations, other woodland areas or buildings.

Essential precautions to be taken are:

1. Burning should be undertaken only on a calm day.
2. Burning should always be carried out into (against) the wind; never burn down wind.
3. Burn early in the day whenever possible and do not burn after dusk.
4. Ensure that there is an adequate firebreak between the area to be burnt and adjacent property when this includes forestry plantations, other woodland areas or buildings.
5. Notify neighbours in advance when burning is to be undertaken (at least 48 hours notice is desirable). If there is any doubt about the adequacy of the precautions necessary to prevent the spread of fire, the Chief Fire Officer and, in the case of forestry plantations, the local Forestry Commission Officer should be consulted. Make certain also that adequate arrangements are made beforehand so as to ensure the speedy summoning of the fire brigade should the burning get out of control.
6. Never leave burning gorse unattended.
7. Make sure that all fires are out before leaving the area. Return an hour later to check again.

Grower-to-buyer trading was the custom. Then wholesale markets. Now the trend may be back to direct sales between producer and buyer in

Horticultural Produce Marketing

P. Howarth

THERE seem to be various interpretations of what constitutes a direct sale and it may be pertinent to start by defining what it means. Such a sale is brought about by the exchange of goods for cash, normally on a pre-arranged basis, the goods passing directly from the producer to the retail organization or point of sale without being handled by an intermediary.

Direct selling is certainly not a new concept in marketing horticultural produce. If one looks back in time it will be found that the old French gardeners produced their crops, hauled them to market on a donkey, and sold them on a cash or kind basis. Nearer home, Covent Garden as we know it today also developed from a place to which the grower brought his own produce from country and market garden to sell himself.

Wholesale marketing

Over the years we find that large markets were started by growers who farmed on the outskirts of the large cities and towns. As populations grew and eating habits changed merchants came into the picture and offered transport services from the growing areas to the markets. The market stands changed from grower-owned establishments into wholesale brokers, who not only handled home grown produce but became agents for foreign produce like citrus fruits, bananas etc., thus offering a wide range of goods.

This system looked like the answer to the problem of marketing of horticultural produce. The farmer produced and harvested his crop, the country merchant offered a transport service, and the wholesaler offered the produce for sale along with other more exotic commodities. It must be remembered that all these operations were carried out at a price, costs being calculated at the market on a percentage basis whatever the value of the crop. A fixed package charge was made by the merchant to include the transport cost and the hire of the crate; again this was charged whatever the realization price. The advantage of this system, at least in theory, was that the grower could send to market on commission all he could produce; he could thus clear his crops, keeping a turnover in his accounts and enabling him to absorb the fluctuating returns as determined by supply and demand and climatic variations.

Swing to direct selling

During the last decade there appears to have been a swing away from normal wholesale market selling back to direct sales. At present about 70 per cent of all horticultural produce passes through wholesale market channels so it would seem that the market still operates at a high level and will probably do so for many more years. What must be taken into account

is a probable change in the function of these markets which may become blocks of offices for produce brokers who will sell by description over the telephone. This will probably apply to both home and foreign produce which will not pass into the markets but direct to a depot system where loads will be broken down and reloaded on to lorries operating under a distribution network.

Some readers may argue that this is 'pie in the sky', but already multi-million pound turnover organizations are operating in this way on a national scale. One such organization at present handles about 10 per cent of all fruit consumed in Britain, and is expanding.

Trends

It will be seen from what has been said that evolution in the marketing of horticultural produce has taken place. Now about 30 per cent of horticultural produce is sold direct by producers. The introduction of the supermarket chain store and, more recently, the 'cash and carry' business has influenced this development; as more of these types of stores are built, produce will go direct from the farm and less will pass through traditional markets. According to statistics of recent investigations into marketing of horticultural produce there has been a drop of 25 per cent in the number of retailers who handle fruit and vegetables. Even so, there are still about 130,000 retail selling points in this country of which about 35,000 are specialist fruit and vegetable retailers. When these figures are examined, one realizes that a huge dramatic swing to a direct selling system is highly improbable and also impracticable at present, due to the lack of planned production, product assembly, and distribution facilities to all points of sale.

About two-thirds of our population lives within a rectangular area approximately seventy miles wide stretching roughly from London to Preston. This is a sobering thought when one considers that most retail outlets must fall within that area, along with the increasing development of supermarkets and chain stores which must be where the large populations are centred. Again, from the map one can readily see that the main producing areas are on the perimeter of the rectangle; exceptions to this are the Channel Islands and Cornwall, which specialize in providing early crops not grown in the main producing areas on the mainland.

When looking at this situation it is seen that direct selling has real possibilities today and in the future, particularly if a rationalized distribution system could be developed incorporating both foreign and home produced fruit and vegetables. In so doing, more economical and efficient terms could be offered to all retail outlets.

The demands of the supermarkets and chain store, which have limited storage space, are the main indicators of future market requirements, even at the corner shop level. Stores of this type buy little from the wholesale market as it does not offer the necessary consistency in variety, size and quality of produce. Neither does it offer stable price conditions so highly desirable in streamlined accountancy to enable a common pricing policy.

For these reasons the supermarkets usually go direct to producers or producer co-operatives who can offer planned production, continuity of supply, consistent quality and size range. In most cases there is no contract but in its place a weekly programme is negotiated between producer and retailer for almost a year in advance. This keeps the price structure steady

and even in times of glut or shortage maintains supplies as consistently and regularly as possible; this means that prices paid by the housewife can remain fairly constant even at the opposite extremes of supplies. This stability helps the producer who can plan his production programme with confidence, knowing that if he is successful in producing good crops he can expect consistently fair prices. For this reason many are being attracted to direct selling because they know within limits what their financial returns will be even before the crop is planted. Coupled with this is the fact that produce will pass through fewer hands, thus incurring less cost and damage.

Outgrades

All this must appear to be a wonderful concept but there are some limitations. The greatest of all to a grower who sells direct to a retail organization is marketing his outgrades after the better grades have been creamed off for packaging. These can amount to up to 40 per cent of a crop and success in selling them may determine the profitability of producing the crop. If the outgrade market could be developed for, say, dehydration, soups, prepared fresh vegetables for canteen use, there would possibly be more growers going into the direct sales system.

However, good outgrade marketing should never be an excuse for bad husbandry. The grower must at all times determine the market specification and grow the maximum quantity and quality within the pre-determined grades to suit these outlets.

Future developments

Where do we go in the future and what changes can be expected? One thing that is certain is that we are now in a convenience food era due to social changes throughout the country. As money levels increase, as more leisure time is available, and as more families live in flats, so the demand for convenience foods will become greater, particularly in the densely populated areas of the country. Problems of limited time, space and refuse disposal are also creating a climate for an increase in this type of merchandising.

There is also a swing towards prepared fresh vegetables 'for the pot', handled from the packer via the store to the housewife. Many organizations have been working on this system for several years and are planning considerable expansion programmes. Direct selling provides the means by which this development can be carried out.

Throughout this article emphasis has been placed on fruit and vegetables, but the hardy nursery stock and soft fruit sectors must not be overlooked. There are few major roads which do not support a garden centre of some kind, or even a fresh fruit stall. The key to this type of outlet is the availability of fresh regular supplies of high quality produce from the propagator or fruit farm. The most direct selling system of all, and one which is certainly becoming popular, is that which enables the casual tripper to spend an enjoyable afternoon on the holding picking his own fruit, such as strawberries, for which a fair price is paid. Undoubtedly, direct selling of horticultural produce is increasing and will continue to do so in a variety of ways. This radical change presents a challenge to the grower and adviser.

The author, **P. Howarth**, is a N.A.A.S. Horticultural Co-operation Adviser stationed at Cambridge.

41. Suffolk

P. J. O. Trist

SUFFOLK comprises the two separate administrative counties of East and West Suffolk. They enjoy a high sunshine record and an average of 25 inches of rain. They have a low undulating topography and in the south west the land rises to 400 feet. The sand hills, which come down to the marsh or form low cliffs on the coastline, together with the river estuaries, the shingle bars and marshes, make up the romance and the difference which Suffolk can offer in its coastline scenery. In spite of farming alterations the general scene remains rural and has not been invaded by development. The vast tracks of the light soils of the Breckland remain a feature of great attraction for the botanist and ornithologist.

Suffolk became subject to enclosures in early Tudor times and, therefore, has had a farming tradition with an arable bias for several centuries. With the exception of the heathlands, there have never been large tracts given to the grazing of livestock. On the other hand, Suffolk has produced breeders and livestock improvers; it is the only county which can boast of three home breeds—the Suffolk Punch, the Suffolk Sheep and the Red Poll. It was also instrumental in the foundation of the Large Black Pig Society which originally set up its office in Ipswich. The county has always taken a keen interest in pig husbandry and in 1969 it had the largest pig population in the British Isles with more pigs than the whole of Wales.

The sands, marshes and fens

The coastal area of light sand is farmed with the marshes which lie at sea level and are defended by clay walls. These sandlings were formerly in heath and some 6,000 acres still remain. About 3,700 acres have been reclaimed since 1949 and the one-time problems of acidity, magnesium and copper deficiencies are now largely overcome. Barley and sugar beet are grown extensively together with an increasing area of irrigated early potatoes and carrots for the canning industry. Vining peas, dwarf beans and Brussels sprouts for canning and quick freeze are important cash and break crops on the sands near the factories at Lowestoft. The marshes, which met disaster in the 1953 floods, are now relatively safe behind the new defences. Drainage is much improved and a large part of the 5,000 acres brought into arable production after 1955 is now underdrained. Wheat is the main crop, with some spring barley and winter beans.

The West Suffolk sands lie from the skirt of the fens to the east of the Breckland, where they join the boulder clay series. By contrast with the acid coastal sands, these are alkali being close to the chalk, and, whilst the area

has a lower rainfall, the subsoil enables lucerne to be grown; this not only provides dairy cow and beef fodder but is a useful break crop for barley. Sugar beet is grown extensively. There was considerable reclamation of the acid heathland in the Breck during the war and post war years, much of which is still cropped with rye and cocksfoot.

The most easterly area of the fens is in the north west of the county and comprises about 12,000 acres. This highly fertile organic light peat produces heavy crops of potatoes and sugar beet. Spring wheat forms a break whilst very little barley is grown. Celery and chicory are additional cash crops.

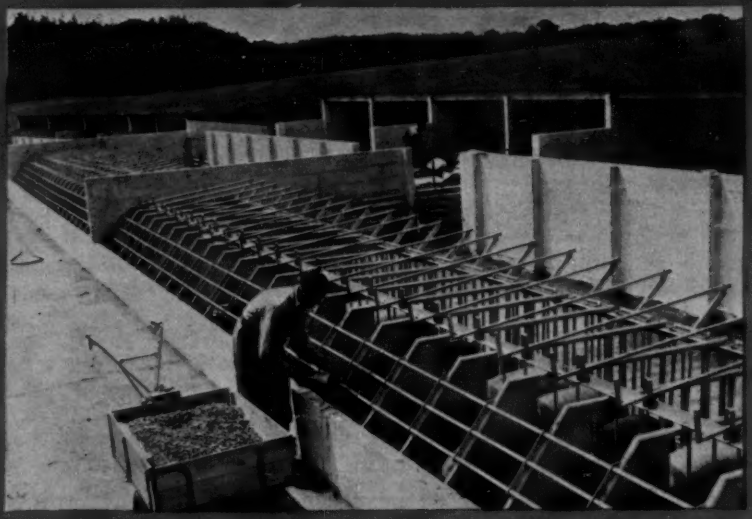
The heavy clays

Almost two-thirds of the area of the two counties comprises the varied soils of the boulder clay, a heavy land series of clay loams which requires careful cultivation and attention to underdrainage and the maintenance of ditches. They are free from mineral deficiencies but are becoming increasingly subject to soil compaction due not only to cultivation in wet seasons but also to the increasing weight of heavy equipment used at cultivation and harvest. At one time this land, like the light land, was rigorously farmed on the four-course shift but is now increasingly subjected to a system which allows little opportunity for change of crop and season for cultivation. Intensive cereal growing is gaining ground at the expense of grass and the grazing animal. The greater part of the dairy herds were once found on the heavy land and many also fattened a few bullocks. Sugar beet has, since 1925, been a pivot of the farming system on most soil types in the county but in the south west the acreage declines. Wheat is taken more often in the course on the clay loams of the west, whilst barley has dominated the rotation on all soils. The 1969 returns showed 296,000 acres of barley out of a total of 433,000 acres of cereals. Field beans, a traditional crop of the old course, have recently had an uplift by subsidy, but they are still an uncertain crop. Marrowfat peas are once again becoming economic, whilst vining peas and dwarf beans are taken on contract wherever there is a possibility to include this useful break in the sequence of cropping. Few potatoes are grown on the heavy land.

Industries

Farming remains the number one industry of the county but has given rise to other associated industries. Suffolk was the home of the Smyth drill which was made at Peasenhall from 1788 to 1967. The great farm machinery firm of Ransomes, Sims and Jefferies Ltd. of Ipswich was started by Robert Ransome in 1785 and today ships equipment all over the world. Another notable manufacturer in the field of farm machinery was Garrett's of Leiston from 1778 to 1932. The Suffolk firm of Fisons Fertilisers Ltd., now part of a great manufacturing complex, was founded in 1847, a few years after Sir John Lawes started his research into the manufacture of superphosphate; today its output reaches the far corners of the earth.

Pig Housing



Gilt yards

This feature, on the housing and management of pigs, contains articles by:

★ **Charles Dobson, A.R.I.C.S.**, who is one of the Ministry's farm buildings advisory officers stationed with the A.L.S. at Reading.

★ **Clement G. Pointer, B.Sc.**, is a Livestock Environment Specialist with the N.A.A.S. stationed at the Ministry's Regional Office at Cambridge.

has a lower rainfall, the subsoil enables lucerne to be grown; this not only provides dairy cow and beef fodder but is a useful break crop for barley. Sugar beet is grown extensively. There was considerable reclamation of the acid heathland in the Breck during the war and post war years, much of which is still cropped with rye and cocksfoot.

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Tethered sow house

Housing the Pig

Charles Dobson

THE factors affecting choice of housing are of course numerous. Many details of design can and should be decided after the basic choices have been made. More important than details is the effect buildings can have on pig performance, feed efficiency, labour and capital costs. Before buildings can be designed, the targets and management system must be decided because, to a large extent, buildings and management are interdependent. When we begin to consider group size, the number of moves and the ages of pigs at the moving stage, the relationship becomes clear.

Moving pigs around

It is now accepted that pigs, and particularly pigs grown for slaughter, should be moved as little as possible. Each move usually results in a check in growth rate and an extra pen cleaning job requiring more labour.

Most systems require growing pigs to be mixed at some stage. Ideally in these systems they should be mixed only once and then at as early an age as possible. After the initial mixing no other pigs should then be introduced. If followed, these two simple suggestions undoubtedly reduce losses due to injured pigs and checks in growth.

If pigs are kept in rearing pens too long on an *ad lib.* diet, not only will feed efficiency suffer but possibly also carcase grading. On the other hand if young pigs are moved into finishing pens too soon they often suffer a severe check, particularly in winter when body heat is insufficient to warm the building. For these reasons it is now widely accepted that they should be between 80–100 lb liveweight before this move.

Farrowing to finishing houses

These considerations can lead to decisions that can have a direct influence on pig performance and indirectly on feed efficiency. To overcome the problems a few farmers have developed farrow to finish systems in one house aimed at cutting out all moves. Whereas some first attempts were based on single litter pens, the most common development is to use pens designed for two litters which enables the pigs to mix from birth. In mild climate areas such as south-west England, a number of farmers use a modified Solari farrowing type house as shown in Fig 1. The farrowing equipment (which can be either stalls or crates) is portable and is removed about fourteen days after farrowing.

If climate permits and checks can be avoided then the simplicity of the house can make the system worthwhile. Farrowing, rearing and finishing accommodation for two sows and litters can be built for about £140.

In most cases specialist housing for growing pigs is provided based on either

4–stage	Farrowing Follow on Rearing Finishing	or	3–stage	Farrowing Follow on and rearing Finishing

There are a number of housing variations in each system and of course both require some form of housing for the dry sows and boars.

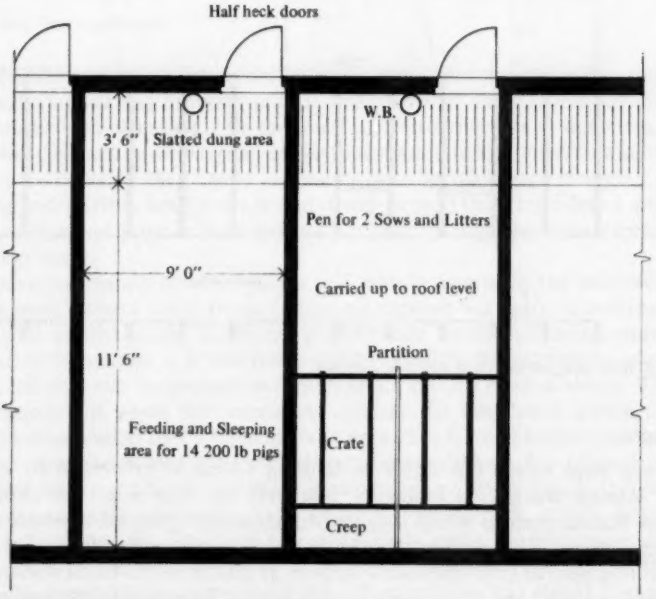


Fig. 1. Modified Solari farrowing house

Sow and boar housing

Two other factors that affect both pig management and buildings are the farrowing index and numbers of pigs reared per sow. An increase in both leads, of course, to increases in housing requirements. To some extent the design of boar pens and service accommodation can affect the farrowing index. A fairly simple but effective layout is shown in Fig 2. Although sow cubicles are used for this stage this does not prevent the sows being stalled (tied if required) after service. It is worthwhile including trap gates in the cubicles to simplify sow handling. Sow housing can vary in many ways with costs ranging from £25 to £75 per unit of housing, the number of units depending on the farrowing index, age of weaning, time spent in service quarters, and other considerations. Usually about two-thirds of the sow herd requires dry type housing.

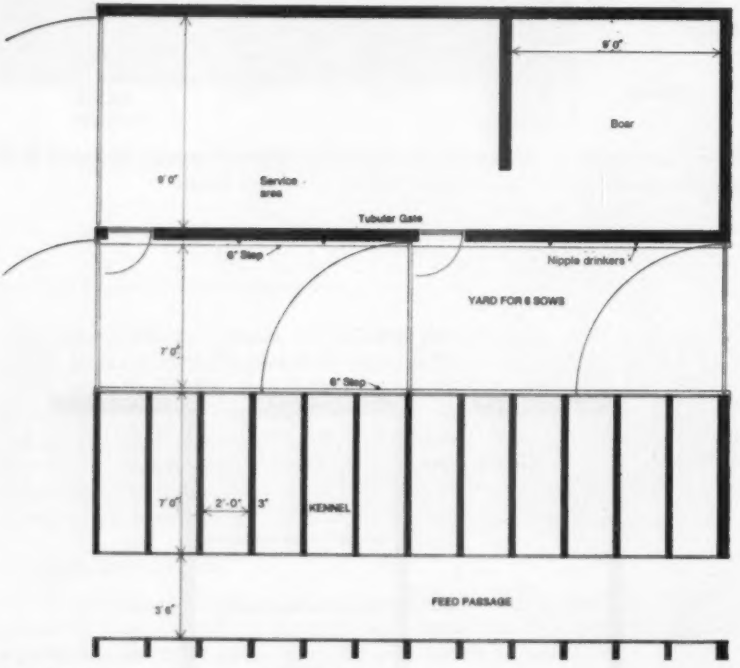


Fig. 2. Boar pen, service area and sow cubicles

Costs

To a large extent the choice of housing system is influenced by capital and interest charges on buildings. Not only do these affect the choice of house but the periods which they are economically occupied by stock at the various stages. This is shown in the Table. In terms of building costs, with farrowing pens at £120 and follow on pens at £200 it would be more economical to keep sows and litters in farrowing pens as long as possible and reduce the time in the rearing pens to a minimum. More typically with farrowing

at £200 per pen and rearing pens at £45 per litter the reverse must apply. If they were both the same cost then new buildings could be planned to allow the change when it best suited the management system.

The Table also shows one reason why low cost verandahs, weaner kennels and sow and litter yards (often called multiple occupation pens) are increasing in popularity. It can be seen that a 3-stage system not only reduces the number of moves but can also reduce building costs. Where farrowing pens are not too expensive and can be used up to weaning the follow on stage should be omitted.

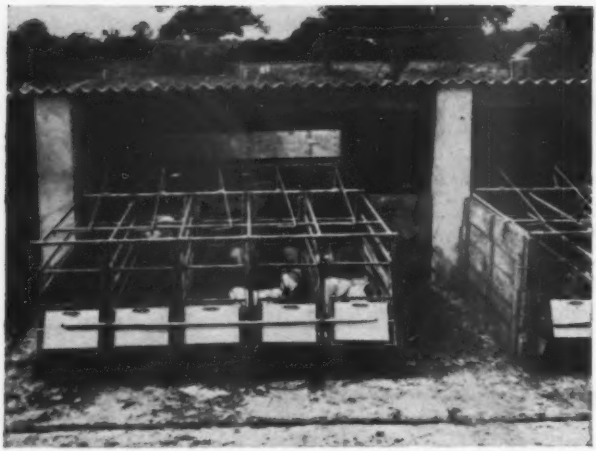
Table **Capital Costs for various stages.**

Stage	*Age of progeny (weeks)*	*Cost per pen per litter (9 pigs)*	*Capital and Interest charges per week at 10% over 10 years (approx)*
		£	*s.* *d.* — *s.* *d.*
Farrowing	0 — 5	120*— 250*	7 8 — 15 8
Follow on	2 — 8	100*— 200*	6 3 — 12 6
Rearing (verandahs and kennels)	3 — 12	25 — 75	1 7 — 4 8
Follow on and rearing (sow and litter yards)	2 — 16	45*— 60*	2 10 — 3 9
Finishing	8 — 30	70 — 200	4 4 — 12 6

*Plus sow where necessary.

The difference in weekly costs between sow and litter yards (or similar accommodation) and finishing pens is worth noting. The possible savings in food costs from changing from the usual *ad lib.* rearing diet to the restrictive finishing diet need to be weighed against the extra housing costs. It is another reason for delaying the change as long as possible. Compare changing pigs at nine and thirteen weeks of age and it will be seen that this offers a choice of throughput of three or four batches per year through the more expensive finishing house.

Production standards at all stages will mainly determine the profitability of the herd. Labour costs are an important expense but more important are food and capital costs. Knowing performance levels and using modern budgeting techniques it is relatively easy to calculate the maximum amount of capital that can be invested in buildings for various rates of return. These calculations will show the investment ceilings. To keep costs within these ceilings often means that if a particularly expensive form of housing is chosen for one stage the money remaining dictates other choices. For example, if a finishing house at £20 per pig place is selected it probably means that sows will have to be housed in low cost housing (tied stalls or cubicle kennels) at £28–£30 per sow. To spend any more might make the investment show an unacceptable return. On the other hand if semi-covered low cost finishing pens are chosen for an exposed site (say £8 per place), this would give poor conversion rates. Since this is an expensive stage for food costs the returns



Monopith sow and litter yards

would again be reduced significantly. There are a number of piggeries at £12–£15 per place that are potentially as good food converters as designs costing £20 per pig.

For sound decision to be made it is clearly necessary for the cost of buildings to be assessed in relation to the effect on returns. Similarly the type of building being examined needs to be assessed in relation to its effect on pig management and performance.

A N.A.A.S. survey in 1968/69 has led to some important practical findings about management in

Finishing Piggeries

C. G. Pointer

THE survey of finishing piggery management was made by N.A.A.S. Livestock Husbandry Advisers in co-operation with the Agricultural Land Service during June-July 1968 and January-February 1969. It covered sixty-nine mainly package deal houses situated in Yorkshire and Lancashire, East Anglia, the South East and the South West. The farmers recorded air temperatures, stock numbers and some management information, and also answered a series of questions about the piggeries. Tribute must be paid here to the care with which they and their workers compiled the various records, and to the willingness with which they co-operated in the survey.

Twenty-five makes of houses were involved in the survey, there being four or more houses from each of seven manufacturers. The survey was conducted as a general fact finding enquiry and was not intended to be the basis for finding the best piggery. Several of the findings are of considerable practical importance bearing in mind the present heavy investment in pig housing.

The farms

The number of pigs per farm in the survey averaged 525. About three-quarters of the farms carried breeding herds, and these had an average of 100 sows. The finishing piggeries had an average capacity of 250 pigs.

The average farm size was 345 acres, with the following distribution of piggeries between farm size ranges:

Farm Size—acres	Under 10	10 to 50	51 to 150	151 to 500	Over 500
Number of piggeries	7	8	11	30	13

This distribution is in broad agreement with the analysis of the 4th June returns which shows that large pig units such as these tend to be on larger-than-average farms. The farms could be broadly classified:

Arable and mainly arable	48
Grass and mainly grass	19
Fruit and arable	1
Concrete	1

Feeding and management system

Thirteen houses had wet and fifty-six dry feeding systems, eighteen being fed in the trough and fifty-one on the floor. The preponderance of floor feeding may be associated with the period during which most of the houses were built, roughly five years ago:

	Before							
Year built	1961	1962	1963	1964	1965	1966	1967	1968
No. of houses	5	2	3	13	19	8	15	4

Sixty of the sixty-nine did not have mechanized feeding. In sixty-three houses pigs were fed twice daily, two were fed once, one 3 times, two 4 times and one 5 times. In the fifty-six houses which did not have a wet feeding system, thirty-eight dispensed water through bowls and the remainder had nipple drinkers. The average weight of pigs was 80 lb on entering the houses and 180 lb at leaving. Thirty-nine of the houses had partially slatted floors. Sixty-five had solid pen divisions. Bedding was used in nineteen houses, eleven with trough feeding and eight with floor feeding. Surprisingly for units of this size, one third did not record either feed usage or pig weight gains.

Operation and control

Sixty of the houses were package deal. About half the owners of these considered that the advice offered by the manufacturers on the running of the house (particularly on the ventilation control system) was inadequate and that a booklet was necessary; apparently in only seven cases was written guidance provided. In about two-thirds of these houses the farmers recalled a follow-up visit from the manufacturers after the house came into use. Faults developed in about a third of the houses during the first year requiring repairs to doors, pen fronts, walls and waterbowls. About one-fifth of the houses also had to have alterations or repairs to the ventilation system in the first year. There were about twice as many faults in the first year as in the second.

Use of space

The figures of space per pig covered a wide range due to variations in design and the fact that manufacturers do not always link the weight ranges of the pigs with the numbers specified as being housed. But the average figure of 80 per cent occupancy of pig places 'purchased' by the farmer indicates the general difficulty farmers have in being able to achieve full use. This could be due to optimistic initial assessment or the difficulty of always having pigs ready as space becomes vacant. Consequently the true housing cost per pig place could average 25 per cent above that budgeted for. Some farmers, however, regularly achieved over 90 per cent occupancy.

Temperature

The maximum, minimum and range of temperatures in the piggeries, and the degrees above the outside temperatures, are given in Table 1. In early July the temperature in parts of England reached 32°C (90°F) and a few piggeries went up to 35°C (95°F), but apart from dirty pens the pigs were not reported

as being unduly affected. In February 1969 there were wide variations between houses and in the performance of similar houses on different farms.

Table 1. **Piggery Temperatures °C (°F)**

	Inside piggeries	*Range inside piggeries*	*Degrees above outside*
July average			
Maximum	23 (74)	28·3–18·9 (83–66)	2 (4)
Minimum	19 (67)	20·6–13·3 (69–56)	6 (11)
February average			
Maximum	18 (64)	22·8– 8·9 (73–48)	12 (22)
Minimum	13 (55)	16·1– 5·0 (61–41)	13 (24)

In general, most package deal houses with fan assisted ventilation achieved better temperature control, both in summer and winter, than other houses in the survey. The home-built type tended to have the highest temperatures in summer and the lowest in winter, whereas, even in cold weather, the temperature in some well managed package deal houses was satisfactory. This could be due to a combination of good stocking density, adequate insulation and good ventilation control.

The variation in performance of similar houses on different farms, showing up to 6°C (10°F) difference in average temperature lift for the month of February, is serious and emphasizes the importance of management. Some houses averaged a 17°C (30°F) lift of temperature above the February external minima, with around 22°C (40°F) temperature lift on cold nights when the outside temperature fell to about −7°C (20°F). A few other houses had night pen temperatures only just above freezing when outside temperatures fell that low. Clearly still more attention should be paid by farmers to winter pen temperature.

This can be seen from Table 2 which, for three outdoor minimum night temperatures, shows the number of piggeries in each of five ranges of minimum night and maximum same-day temperatures reached in houses in the survey in East Anglia, Yorkshire and Lancashire.

Table 2. **Number of piggery houses in temperature ranges by minimum night and maximum same day temperatures**

Minimum night outdoor temperature	*Temperature ranges °C (°F)*				
	−1 to 4·5 (30–40)	4·6 to 10 (41–50)	10 to 15·5 (51–60)	15·6 to 21 (61–70)	Over 21 (over 70)
	Number of houses by minimum night temperatures				
−7°C (20°F)	2	8	18	4	
+2°C (35°F)		2	19	10	1
+7°C (45°F)			17	15	
	Number of houses by maximum same day temperatures				
−7°C (20°F)		1	11	18	2
+2°C (35°F)			6	22	4
+7°C (45°F)			2	21	9

At an average daily pen temperature of 7°C (45°F) feed conversion efficiency may be depressed by 15 per cent compared with pens at 15·6°C (60°F). In draughty piggeries the difference would be greater.

Relative humidity

It is known that the pig is almost a non-sweating animal and that the level of air humidity is not critically important. Measurements made in the houses gave a range of from 55 to 90 per cent RH, averaging between 70 and 75 per cent both in summer and winter. The higher figure of 90 per cent may cause deterioration of the building but except at very high temperatures would be unlikely to affect the pigs.

Ventilation

Ventilation standards have changed over the years and whilst the oldest houses with fans sometimes offered less than 0·2 cubic feet per minute per pound liveweight housed, newer houses were mostly in the range 0·3 to 0·6 c.f.m. As might be expected, summer temperatures were often higher when less air was provided. In many cases, however, the incoming air in summer mainly treks up under the house roof and is not used to the best advantage. In some cases the management appears not to be using the ventilation control properly, and there was indication that this was overridden by wind in winter. Also, in some cases the thermostats or thermistors were not well sited in the piggery. It would seem that some manufacturers need to give further thought to air inlet and outlet design in order to get good air circulation around the pigs, without draughts, and to keep out the winter winds. Farmers tend not to alter the ventilation controls quickly enough with changes of weather, while some of the fan control systems installed did not allow a fine enough control of fan speed.

Dirty pen floors

These were recorded five times more frequently in the summer than in the winter. It appears that in summer, when pens are too warm, pigs try to create wallows. Where dirty pens were reported in winter, it could sometimes be seen that air temperatures in the pens were high (19°C (67°F) or over) or that there was a draught of cold air coming into the sleeping area of the pen. Due to differing results from similar houses, management again appeared important, but good ventilation at pig level appears to be a prime requirement for clean floors.

Tail biting

Whilst this was widespread there was a lower incidence of serious cases recorded than had been expected, even allowing for the fact that some pigs had already had their tails shortened. A few farms had serious problems, but survey data such as this is unreliable in providing solutions. There appeared to be no clear cut differences between houses where tail biting occurred and those where it did not; it will be remembered that most of these houses were fairly intensively stocked. The habit was recorded about twice as frequently in summer as in winter. In one house it was reported that it was reduced when the pressurized ventilation system was modified by the introduction of slotboard ducting so that there was less air turbulence around the pigs. In

another case the vice ceased when pigs were moved at about 140 lb liveweight to another house which, apart from having considerably larger dunging area per pig and a lower ventilation potential, was similar to the previous house in that it was partially slatted and had wet feeding. In a few cases there was evidence that tail biting may have worsened when the ventilation was greatly restricted in order to maintain temperature on very cold nights.

Feed conversion efficiency

Bearing in mind the wide range in types of houses, in feeding and management practice, in levels of disease and in breeding policy, it was not considered useful to try to collect information to correlate weight gain with feed usage and house type.

Management

The most important factor throughout appears to be keen intelligent, day-to-day management. No amount of stockmanship can remedy the faults in really bad housing. On the other hand, even well designed piggeries can yield disappointing results when husbandry and management are below average.

Report on Agricultural Marketing Schemes

The latest annual report on the operation of Agricultural Marketing Schemes has been published. It covers the period 1968–69 and includes the accounts of the Marketing Boards in operation during the period and statistics concerning the Schemes. The Boards covered by the report are:

Hops Marketing Board
Milk Marketing Board
Scottish Milk Marketing Board
Aberdeen and District Milk Marketing Board
North of Scotland Milk Marketing Board
British Wool Marketing Board
Tomato and Cucumber Marketing Board (in process of winding up)
Potato Marketing Board
British Egg Marketing Board

Copies of the Report (House of Commons Paper No. 139) may be obtained from H.M. Stationery Office or through booksellers, price 16*s.* (by post 16*s.* 6*d.*).

Whether or not Britain joins the European Economic Community, there is much of interest in the changing structure of

Common Market Agriculture

R. C. Rickard

THE original aim of the Common Agricultural Policy of the European Economic Community was, through a 'managed market', to establish farm product prices at levels which would allow the predominantly small farmers of the 'Six' to earn an adequate living while, at the same time, promoting a process of structural change towards larger and more efficient units. In the event, the outcome has been high prices, considerably above those ruling outside the Community, and surplus production, the disposal of which incurs a heavy bill in subsidies from the European Agricultural Guidance and Guarantee Fund (F.E.O.G.A.). Furthermore, structural changes have been relatively insignificant, despite the very considerable encouragement given at national levels.

On the other hand, the number of employed workers and working relatives in agriculture has diminished. In the mid-1960s the annual rate of decline varied between roughly four per cent in France and eight per cent in Belgium and the Netherlands. However, the reduction in the numbers of farmers and of holdings has been only at about half this rate, and consequently over four-fifths of the farmer population are on farms which together account for less than half the farm land in the Community; a great many of the existing holdings can never provide full employment for even the farmer himself let alone hired labour.

The average size of farm in the Community is at present no more than about 11 hectares (roughly 27 acres). Some 170 thousand farms are more than 50 hectares (125 acres) but together they account for only a mere three per cent of all farms of one hectare and over. It is hardly surprising that the predominance of small units is equally evident in the farm enterprises. Of the four million or so dairy farmers, only about two per cent keep more than twenty cows and 80 per cent have ten or fewer cows.

Mounting cost of surpluses

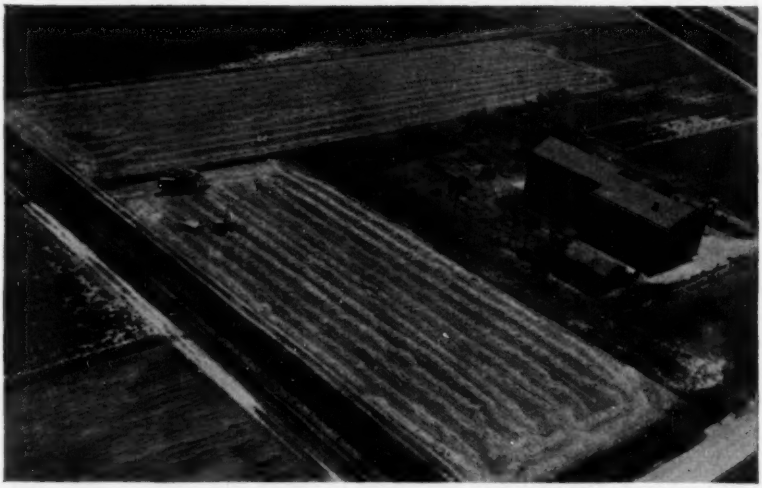
Financial pressure has compelled the E.E.C. to admit that its Common Agricultural Policy is in need of radical re-appraisal. The flow of funds for price support from the Guarantee Section of F.E.O.G.A. has mounted rapidly since it first began in 1962/63 and the magnitude of such funds has now become a matter of great concern to the finance ministries of member States.

The increases in the Guarantee Section have been due to two factors. First, more and more commodities and commodity groups were incorporated in the Common Agricultural Policy, and F.E.O.G.A. assumed respon-

sibility for financing market intervention and export subsidies for these. The second factor, and from a policy point of view the more important, has been the increase in production, especially of cereals and dairy products.

It is noteworthy that although the cereals acreage in the Community has fallen slightly over the last decade, production has increased significantly because of sizeable gains in yields. The increased productivity has been provided by technical and managerial factors—continued improvements in seed varieties and cultural practices, increased fertilizer use, and crop specialization. The financial implication of this increase is that the cost of market intervention in the non-durum wheat sector alone in 1969/70 is expected to be about £230 million. In 1967/68, market intervention expenditure for all cereals was less than £70 million.

A similar situation has arisen with dairy products. From 1960-68, the number of milk cows in the E.E.C. rose by only three per cent but, due to a ten per cent increase in average yield per cow, milk production rose by 15 per cent and deliveries to dairies by 30 per cent. Although the F.E.O.G.A. expenditure in the dairy sector was limited from 1968 onwards, the costs involved in supporting the dairy products market are indeed staggering. In 1968/69, intervention costs for butter alone were nearly £150 million and estimates for the following year are nearly £220 million.



A typical Italian farmstead

The Mansholt Plan

In an attempt both to raise farmers' living standards and to reduce the exorbitant cost of the agricultural policy, far-reaching proposals were put forward by the E.E.C. Commission in December 1968. The 'Agriculture in 1980' programme, or the so-called Mansholt Plan, aimed at 'extricating agriculture from its present position, where it is handicapped both economically and socially'. To achieve this, two types of measures would be required. The first concerns the structure of production, with an appreciable reduction in the number of people engaged in agriculture and the creation of farms of

adequate dimensions. The second involves agricultural markets, with the double aim of improving the way they work and adjusting supply more closely to demand.

The only feasible way to ensure larger and more efficient farms and, at the same time, to raise farm incomes is by reducing the agricultural working population. The Plan envisaged a whole range of inducements for farmers to retire or seek other work, including indemnities to farmers leaving agriculture, advanced retirement schemes, vocational training and alternative employment opportunities. Those remaining in agriculture would then enjoy better living and working conditions through increases in the size of farm units. The plan proposed setting up large-scale 'production units' and 'modern agricultural enterprises'. The former would be the combined operation of several farms, or parts of them, a form of horizontal integration appropriate for small mixed farms; the latter would be formal corporately-operated businesses to which farmers would contribute their capital assets. In order to qualify for grants for the creation of larger businesses, certain minimum sizes were suggested: 200—300 acres for field crops, 40—60 dairy cows, 150—200 beef cattle or their equivalents, 10,000 laying hens, an annual output of 100,000 poultry or 450—600 pigs. It was appreciated that the larger and more productive units would result in a further worsening of the position with regard to the large surpluses existing in the Community; to alleviate this land would have to be taken out of production. It was proposed that about 12 million acres would be released from agriculture, most of which would be used for forestry to offset part of the E.E.C. deficit in timber.

Better marketing methods would be needed if this reorganization were to bring commensurate benefits to both producers and consumers. Community inter-professional groups or marketing boards would be created which would be responsible for market development, sales promotion, grading and integration of their particular industry from producer to consumer.

The cost of the various proposals was put at £1,000 million a year throughout the 1970s. If the measures were fully adopted, total F.E.O.G.A. funds from 1980 onwards would be limited to approximately £850 million, of which only about £300 million would be needed for market support.

The Plan also proposed more immediate action to check the growing surpluses. In order to stimulate butter consumption, there would be a sharp reduction in its price, together with a tax on margarine. In addition, there is a special programme to reduce cow numbers by removing 250 thousand dairy cows annually in 1969 and 1970 and a total of three million by 1976 was proposed. The necessary regulations to reduce cow numbers came into effect in November 1969. Slaughter grants are payable to farmers keeping between two and ten dairy cows provided they give up milk production entirely, and for farmers keeping more than ten cows grants are payable for the non-marketing of milk and dairy products.

Further proposals

Some time has elapsed since the Plan was submitted to the Council of Ministers in December 1968. It remained a controversial talking point during 1969, but little action was taken. Then, at the end of 1969, a further version was issued covering the period up to 1975 only, unlike the original Plan which looked as far ahead as 1980. This plan, known colloquially as

the Mini-Mansholt Plan, is an attempt to get the Council to begin discussion of at least some of the measures which the Commission believes are necessary to get agriculture on a sound footing over the next ten years, and it forms the guidelines of policy decisions at present being formulated. It is noteworthy that no further mention is made of the proposed 'production units' and the 'modern agricultural enterprises' that were such a controversial feature of the original Plan.

Once again the financial burdens of the surpluses, as well as the worsening economic and social conditions of those engaged in agriculture, are emphasized. While the measures such as those relating to the withdrawal of land from agricultural use and income indemnities for those leaving farming, especially dairy farming, still remain, considerably greater emphasis appears now to have been placed on the role of producer associations chiefly concerned with marketing on behalf of their members. They would ultimately be incorporated into marketing committees co-ordinated on a Community basis and taking an increasing responsibility for production and marketing. This implies some method of exerting control upon price formation and putting pressure on producers themselves to accept some measure of discipline as to their level of production.

Finally, it may be necessary to provide some form of direct income support payments to farmers who are unable to take advantage of the structural measures proposed. This is a recognition of the fact that the main element of the Common Agricultural Policy, the guarantee of prices for nearly all agricultural products produced within the Community, has as its basis social and not economic considerations. To alleviate the hardship from lower prices which would affect some producers, measures of direct income support, limited in time and not tied to individual products, must be complemented with concentrated measures of structural reform. This would appear to be the solution to the conflicting problems of improving farm incomes and of avoiding the excessive burden arising from an increase in supply that is out of proportion to the increase in consumption.

The author, **R. C. Rickard, B.Sc.,(Econ.),** is a member of the Agricultural Economics Unit, Exeter University. Since 1966 he has studied the E.E.C. marketing regulations for fatstock and meat on behalf of the Pig Industry Development Authority and, later, the Meat and Livestock Commission.

Eggs Authority

Chairman and Deputy Chairman

The Agricultural Ministers have invited Mr. A. R. Collingwood to be Chairman of the Eggs Authority and Mr. J. F. Phillips, O.B.E., to be Deputy Chairman, and they have agreed to serve. Mr. Collingwood is at present General Manager (Agriculture) of the Midland Bank and is President of the 1970 Poultry Industry Conference. Mr. Phillips is Secretary of the Chartered Institute of Secretaries and was previously Assistant General Secretary of the National Farmers' Union of England and Wales.

A challenge accepted by an enterprising Cardiganshire farming partnership is the subject of this artcle on

Land and Stock Improvement in Wales

J. D. Gwynn Jones

AT TYNGRAIG, Talybont in Cardiganshire, father and son, I. R. and Gwilym Jenkins together farm in the region of 1,000 acres. About 400 acres is crops and grassland, much of it reclaimed from rough pasture, and the remainder is mountain. The farm now is made up of several holdings, which vary from lowland at Talybont, through ffridd or lower enclosed hill, to the peak of Moel y Llyn. The altitude ranges from 100 to 1,750 feet above sea level and the rainfall from 40 to 70 inches a year. Stock consists of forty-eight Welsh Black breeding cows, mainly pedigree, 100 head of cattle of varying ages, and a flock of Fully Registered Welsh Mountain sheep numbering 1,060 breeding ewes and 320 ewe lambs as flock replacements.

In the autumn of 1963, 600 acres of land, comprising three holdings, Gwarcwm Uchaf, Cae'r Arglwyddes and Blaencletwr Fach, were bought to replace the sheepwalk of Dolrhuddlan lost to tree planting. It is the rapid development of this part of the farm in particular, both in terms of land and stock improvement, that has been so impressive.

Land improvement

The 600 acres at the time of purchase could be divided into seventy of fields or in-bye, sixty of ffridd and 470 of mountain. A small proportion of the ffridd was covered by gorse and of the mountain by bracken, mainly on a south-facing slope. Thirty acres of this dry land was soon fenced, ploughed and reseeded by farm labour, with contractors applying ground limestone and basic slag.

However, the soil of the upland, in general, was of a peaty nature; ploughing could well have interfered with natural drainage by burying the surface mat and would certainly have led to a rapid invasion of the pasture by rushes. It was thus decided in 1964 to renovate the native sward by surface improvement but to refrain from unduly breaking the surface crust overlying the peat.

The first step on the rest of the ffridd was to apply a dressing of not more than two tons of ground limestone and up to one ton of 12 per cent basic slag per acre. In late winter of the following year, after frosts and easterly winds had parched the herbage, the Molinia, or flying bent grass, and Nardus, or moor mat grass, were burnt against the wind. In early spring the land was disced, the aim being to make shallow slits into which seed could fall but

not to expose clods, on which seed might well germinate and fail in dry weather. It was fairly dry ground and the best time to cultivate such land was when a few showers had softened the surface, after a dry spell had made the land firm enough to hold a tractor. The seeds mixture was of seconds of perennial ryegrass (S23), timothy (S48), white clover (S100 and S184), together with 2 lb of alsike clover per acre. Harrowing and rolling quickly followed seeding and a dressing of 2-3 cwt of 20:10:10 fertilizer per acre completed the operation.

Seeding in late March/early April forestalled the growth of Molinia by at least a month, and heavy stocking with cows and calves followed during the summer to keep the native vegetation at bay and encourage the sown grasses and clovers to establish and develop.

The two-stage method of renovation continued on the mountain, fencing a block each year, and was coupled with a high standard of grassland management involving controlled grazing, continual topping and periodic slagging. It became apparent, over the years, that the sown grasses and, in particular, the clovers were gaining at the expense of the native vegetation. Ewes and wether lambs were grazed with the cattle during the summer as the swards improved and indeed became essential in controlling growth as more land was renovated each year. Liming in itself softens the surface crust and great care was taken, particularly on the deeper peat, to remove cattle in wet weather to prevent poaching and the subsequent germination of rush seeds.

Land improved by liming and slagging

By 1968, however, it became apparent that on one improved part of the mountain, rushes were beginning to establish a hold. Because of this it was decided to forego discing on land to be seeded that year, after a slow and effective burn had made the ground very bare. Seeds, based largely on white clover cleanings, were sown on the uncultivated, burnt surface; the land was rolled and yearling sheep stocked heavily to tread in the seeds. The establishment of clovers was as good, if not better, than in previous years but, as was expected with no cultivation, the grasses were less in evidence.

In 1969 another development was to apply lime and basic slag to an extensive part of the mountain, with no definite commitment in mind to sow seeds in the following year. Half of the acreage was on a south-facing slope with a close-knit, grassy sward, which is already responding to manuring

and controlled grazing only, but into which it might be difficult to introduce clover in the immediate future. The remainder was of the more open type of sward already renovated in the past, where the response to manuring is likely to be less but where it would be practical and worthwhile to sow clover now, preferably without any cultivation.

In short, between 1964 and 1969 some thirty acres had been ploughed and reseeded, ninety seeded by surface-treatment and a further 140 limed and slagged. In that period the net cost to the farmer of lime, manures and seeds for the initial improvement came to about £2,400 and that of 5,000 yd of fencing to around £600. In addition, the net cost of applying a maintenance dressing of half a ton of basic slag per acre every third year to 260 acres would be about £200 a year.

Stock improvement

In 1963, only part of the existing sheep stock of some 600 ewes was taken over on valuation, for it had been hoped to settle part of the Fully Registered flock from Dolrhuddlan on the hill. Louping-ill, however, prevented this from taking place and a start was made in up-grading the depleted number of breeding ewes. Hardy rams of the type that had proved their worth in the past by improving the type, size and fleece weight of the ewes were used. In addition to visual assessment, full advantage was now taken, in co-operation with the University College of North Wales, the N.A.A.S. and the British Wool Marketing Board, of ram performance and progeny tests as an aid in selection. In 1968, at a Field Day arranged by the Welsh Mountain Sheep Society, panels of judges from five upland counties inspected the flock and placed it in the Fully Registered category.

The land improvement programme has augmented the wintering ground of the ewes and provided better summer keep for an increasing proportion of ewes and wether lambs. It is the practice on this farm to give the shearlings and any ewes in low condition preferential treatment by bringing them down on to better keep after the turn of the year. Older ewes follow in stages as winter progresses, the pace depending upon the condition of the ewes and the weather. The improved hill land now bears the brunt of this grazing in late winter, enabling some of the fields to be kept back for lambing and avoiding severe over-grazing of the lower land, which would limit summer production.

An increasing proportion of wether lambs are sold fat off their mothers. The remainder are substantially bigger at weaning and reach heavier slaughter weights in a shorter time on rape than those coming off the unimproved hill; this is in line with work at Pwllpeiran N.A.A.S. Experimental Husbandry Farm. Trials at the Hill Farming Research Organisation have shown that high growth rate of lambs can be maintained after six weeks of age only if good pasture is freely available, which underlines the justification for cheap and effective methods of hill pasture improvement.

In short, some 600 breeding ewes were maintained on the 600 acres in 1963 with an estimated lambing percentage of seventy-five, while the corresponding figures for 1970 are 800 breeding ewes and an actual lambing percentage of ninety-five. The combination of higher stocking and lambing percentage has doubled the number of lambs for sale, while the wool clip has increased by 50 per cent. In the farmer's opinion, however, the greatest benefits are qualitative and it is estimated that the lambs at weaning in

August are now worth some 25*s*. more and the ewes at drafting in September about 20*s*. per head more, than in the past. The cows have doubled in number from twenty to forty and have been of immeasurable benefit in improving the pasture for the sheep.

Conclusion

It is a measure of the partners' resilience, with whom it has been a pleasure and a privilege to work throughout the years, that they have already more than made up for ground lost to forestry; and of their versatility and ability to adapt their methods of land improvement to suit different soil types. Land and stock improvement have gone hand in hand and it is no accident that Isaac Jenkins has been Chairman of the Cardiganshire Welsh Mountain Sheep Society since its formation in 1956.

This article has been contributed by **J. D. Gwynn Jones, B.Sc.(Hons.) (Wales), Dip.Agric. (Cantab.),** who is a District Agricultural Adviser at the Ministry's office in Aberystwyth.

The Ministry's Publications

Since the list published in the November 1970 issue of *Agriculture* (p. 528) the following publications have been issued.

MAJOR PUBLICATIONS

BULLETINS

No. 37 Silage (Revised) 9*s*. 6*d*. (by post 10*s*.) (SBN 11 240337 9)
No. 51 Narcissus Pests (Revised) 13*s*. (by post 13*s*. 4*d*.) (SBN 11 240351 4)
No. 56 Poultry Housing and Environment (Revised) 11*s*. (by post 11*s*. 6*d*.)

OUT OF SERIES

Safety, Health, Welfare and Wages in Agriculture. Report for 1st January to 31st December, 1969 (New) 2*s*. 3*d*. (by post 2*s*. 7*d*.) (SBN 11 240992 X)

FREE ISSUES

ADVISORY LEAFLETS

No. 54 Black Bean Aphid (Revised)
No. 276 Club Root (Revised)
No. 439 Feeding Separated Milk (Revised)
No. 552 Breeding Records—A Management Aid in the Dairy Herd (Revised)

Priced publications are obtainable from Government Bookshops (addresses on p. 582) or through any bookseller. Single copies of the free items are obtainable from the Ministry of Agriculture, Fisheries and Food, (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT.

Winter Storage of Poisonous Substances

Careless storage of pesticide products can lead to accidents. Now that the main spraying season is over users should take stock of the chemicals they have left. Full and partly-used containers should be stored under lock and key away from food, feeding stuffs, seeds and fertilizers, and where neither children nor animals can get at them. Pesticides should be kept in their original containers and care should be taken to see that these are tightly closed, that they do not leak, and that they are clearly and indelibly marked to show what they contain.

The author discusses how farmers in an area of Lincolnshire which presents special farming problems have succeeded by combining livestock with arable husbandry techniques

Mixed Farming in Lincolnshire

J. H. Grainger

THERE is an area of land beloved of Alfred Lord Tennyson which may be described geographically as where the Lincolnshire South Wolds run off into the South Lindsey Fen. Even today this area has a natural charm where Tennyson would feel at home, although matters such as field size, new crops, machinery, grain stores and fewer sheep would perhaps puzzle him.

Geology

For geological reasons this area, lying to the north and south of the main Lincoln to Skegness road, has posed some especially difficult problems for the farmer who has tried to keep up with the recent agricultural revolution. Geologically there are three distinct materials, the chalk, the Spilsby Sandstone and the Kimmeridge clay. These do not of themselves pose insurmountable obstacles individually but the manner in which they lie in relation to one another makes it difficult to draw clear black and white distinctions in farming systems for any particular farm as has been the tendency in the past.

It is not uncommon to find all these soil types appearing in one field, or that one merging into another causes specific drainage problems.

In the area generally described, the higher land tends to be chalk running into sand as altitude decreases, with the valley bottom often being clay. The standard description of the soils in textural terms are loamy sands, sandy loams, loams, silty loams, sandy clay loams, clay loams and silty clay loams.

The chalks are highly calcareous with a pH of 7 or more. The sands are inherently very acid, pH 4·6 or thereabouts, but very rich in phosphate. Often the pH of these sands has been raised in recent years by heavy liming to the point where manganese and magnesium deficiency symptoms can and do occur, with a corresponding effect upon crop yields. The heavy soils are intractable and require very careful handling if they are to be farmed in any sensible fashion.

Change

In past years much of the area described was in permanent pasture but as economic forces began to play their part in the arable scene the old grass was ploughed out and the pendulum swung from the extensive sheep, beef and barley system to the other extreme where barley was King and stock

became almost a dirty word. Output on many farms doubled and all the visible external signs of a healthy agricultural economy manifested themselves. Large combines, grain stores, powerful tractors—a new sub-culture emerged. The farmer's standard of living rose and became geared to this new sub-culture and all appeared to be set fair.

Unfortunately, nature and national economics seem to reject extremes, and a combination of difficult seasons, rising costs and inflation all affected the disposable income of farms running exclusively arable systems. Assets had been transferred from appreciating livestock into depreciating machinery; labour was, and still is, leaving agriculture at an alarming rate; wages are increasing.

The effect of transferring capital from stock to machines had not been realized by many and in the face of difficult seasons and poor profits the standard of living had to be maintained. This was not difficult at first as depreciation was used as disposable income; but the stark realities had to be faced sooner or later, machines either became very expensive to maintain or had to be replaced. The true situation became apparent only when the cash-flow started to become deeper and deeper red; bank managers, due to circumstances beyond their control, became obliged to point out that this state of affairs could not be prolonged indefinitely and solutions to these problems became imperative.

The prudent farmer

It would be wise to pause and consider the situation where things had not gone wrong, where income remained high and yields were still respectable despite the appalling weather.

Typically, we have the man who was able to perceive the shades of grey and asked the question 'Why has my grassland been giving a poor return compared with my crops?' rather than accept the bald statement that grass was not paying and therefore ought to be ploughed out and put into crops. The reader must understand and accept that the general attitude of farmers to livestock in an essentially arable area is unique. In technical argument on arable matters they have no peer, but where grazing stock are concerned they are most conservative. To adopt an entirely arable system had great appeal. For example, labour problems connected with stock management, fence maintenance, watering and the seven day week are avoided.

The men who are riding the present storm are those who accept livestock with all their organizational drawbacks and treat them with the same technical respect that they apply to their arable pursuits.

If all the land was of the best Wold type there would be no difficulty, but to impose an intensive arable system on unsuitable soils was doomed to failure in the event of inflation or bad weather. Had some of these soils been in an area with a summer rainfall in excess of 12 in. they would have been in grass without doubt. Sand cannot be farmed indefinitely without substantial returns of organic matter or the structure will deteriorate to give a severely limited yield even in the best seasons. Clay will grow excellent wheat if an entry crop can be found, but continuous arable cropping on such soils, which are difficult at the best of times, is bound to create structural instability unless remedies are built into the system. This is precisely what the successful men have done. They saw the shades of grey, they designed their systems to be complementary to their problem soils and set about the business

of making livestock pay in their own right, as well as providing the entries required for higher return cereal crops. Their capital is still intact, much of it walking around on four legs, and they can face the future with little worry.

The modernization of livestock systems to complement the current arable needs for more wheat and better yields has been done in several ways. Two systems which have been adopted can be considered.

Sheep only

The first depends upon buying in-ewe and wether lambs at the right price. Grass as an undersown two-year ley is provided for summer grazing and wintering is based on kale and roots. The stocking rate on the ley is ten sheep per acre, principally maiden gimmers to avoid conflict of lambing with spring drilling. These potential fat lamb mothers are bought in the autumn and are put on to the autumn bite of the second year of the ley which has been prepared by a dressing of 30 units nitrogen, phosphate and potash. Later they are outwintered on hay, mangels and corn and go on to the leys in the spring. They are sold as breeding shearlings in late summer.

Small wether lambs are bought in the early autumn, breed being dictated by price. These sheep firstly graze maiden leys, fertilized after corn harvest with 60 to 70 units of nitrogen, before being put on to kale. The variety Maris Kestral has proved successful in that it displays sufficient winter hardiness for our harsh eastern winters with a better use of the stem than is the case with the traditional thousand heads. Surplus summer grass is sold off as a standing crop of hay, some being taken back in kind as winter fodder.

When the kale is finished the wethers are moved on to swedes, the varieties Bangholm, Best of All, Wilhelmsburger and Tipperary being eaten off in that order. A useful practice is to drill swedes and kale in strips with two rows of swedes to eight rows of kale, the swede rows being the lines for the sheep netting. The fertilizer used will be a seed bed dressing standard for swedes, and extra nitrogen will be injected along the kale rows. This is where the difference lies. Locally the practice has been to fertilize the lot as if for kale with the resultant loss of rotten swedes, a loss which can amount to an unacceptable 20 per cent of the acreage. This is thought to be avoidable by the differential drilling of nitrogen. The wethers are sold off through local markets when they are fat, sales continuing into April.

Here then is a sheep system fitting in admirably with the arable operations and providing the necessary entry for winter wheat The key is clearly the purchase price paid for lambs, but in a well integrated simple system the farmer has the time to look for the best buy.

Mixed stocking

The second system covers a similar farm, typical of the area, on which both beef and sheep are to be found. The beef enterprise is based on selling fat animals from the farm's Lincoln Red suckler herd. The main object in having the sucklers is that it is the only enterprise which can effectively use difficult permanent pastures and mop up the sheep leys without running into serious trouble from worms.

The calves are born in the late winter and go out to grass with their dams in the spring. They are housed in a covered yard. During the winter the cows

receive hay and straw and, after calving, a little supplementary concentrate. In summer, little attention is needed and once the suckled calves have been weaned they are brought inside and put on to a ration designed to give a liveweight gain of 2 to 2½ lb per day. The ration is simple, consisting of hay and a mixture of barley and grain balancer. The cattle are sold out of the yards when a satisfactory deadweight price has been agreed. They achieve a weight of 1100 lb or more at 15 months of age. The main problem in this system is muck handling and straw leading and the farmer is thinking of installing cubicles to avoid bottlenecks at critical peak labour periods.

The sheep story is traditional, with a mixed breeding flock of Longwools and Lincoln Suffolk crosses put to the Suffolk tup. Some ewes are lambed early to produce Easter lambs but the bulk of the flock lambs in March with lambs going fat off grass or roots. Lambing is done inside using family labour and the profits per ewe are very good. The enterprise is being modified to intensify grass utilization and the Longwools are being run down by natural wastage and replaced by crossbreds. With family labour available for lambing the farmer can concentrate more on raising the lambing percentage than would be prudent with hired shepherds; then a high stocking rate and lower lambing percentage would be more realistic. The aim is a stocking rate of five ewes per acre using two-year leys, but it is possible to run the leys on into the third year and graze them by the Lincoln Reds as circumstances dictate. Parasitic burdens are kept down by not allowing lambs to graze leys which have had sheep on them before.

A double break

In both cases under discussion the opportunity to take a double break from wheat and barley exists by combining oats with a one year ley, oats with roots, and a contract vegetable crop or land letting for peas or potatoes with a one-year ley or a two-year ley. A double break of itself gives the opportunity to grow a double wheat crop which has good return advantages, so reducing the less profitable barley acreage on the farms.

The point of great interest in both these situations is that a surprisingly low level of fixed costs has been achieved, but both farms are giving a good gross output. Not, of course, as high as from a cash root situation but nevertheless very satisfactory. The cost/output structure is such that the fixed costs are unlikely to escalate, as has happened on so many farms in the area, and the need for repeated injections of capital in times of general financial stringency is avoided.

The author, **J. H. Grainger, B.Sc.**, is a District Agricultural Adviser of the N.A.A.S. at Alford, Lincolnshire.

Conference of British Cattle Breeders

A Winter Conference of the British Cattle Breeders' Club will take place at the University Arms Hotel, Regent Street, Cambridge from 11-14th January 1971.

The programme will include an examination of such diverse subjects as progeny testing, cytogenetics and calf losses, the cattle industry and the future, co-operative beef breeding programmes, an illustrated review of European breeds and several other interesting subjects.

All enquiries should be addressed to The Secretary, British Cattle Breeders' Club, Lavenders, Isfield, Uckfield, Sussex.

Controlling Dimensions for Farm Buildings

L. Woodhams, *Agricultural Land Service, Wolverhampton*

In an article in *Agriculture*, June 1969 (pp. 253–6) reference was made to the opportunities likely to result in the industrialization of farm buildings from the application of dimensional co-ordination within the confines of the change-over to the metric system.

Since that article was written the Agricultural Land Service, with the full support of the Country Landowners' Association and other interested organizations which from the outset have been closely associated with the change-over as it affects the construction industry, has carried out an academic study into, coupled with its practical knowledge of, the horizontal spacing of structural zones and the principal vertical height dimensions that would best suit farm buildings.

Recommendations have been made and a series of consultations has taken place with designers, manufacturers and users. An account of the recommendations may therefore be of general interest to readers.

Before the sizes of components (the kit of parts) for farm buildings can be assessed it is necessary to establish the probable range of overall building sizes that may be needed. It also had to be acknowledged that such sizes must not be limited to particular constructional systems or methods but must be capable of equal application to all materials—steel, concrete or timber frames, bricks and mortar. The probable requirements for unknown materials of the future also had to be borne in mind.

A list of functions for agricultural buildings was drawn up, from which critical dimensional requirements emerged, for instance, a cow cubicle, tractor width, the length of a farrowing crate, a stacking pattern of battery cages. With this knowledge, and an awareness of agricultural building use, a range of basic dimensions was developed; then followed a list giving preference to applying multiples of the internationally agreed module of 300 mm, rationalized to a sensible increment of size. In the list, those dimensions capable of maximum application of functional demand were regarded as first preferences, lower preferences being more and more limited in particular application.

It was found to be important to dimensional co-ordination that the controlling lines, that is the reference lines to which the controlling dimensions relate, should conform to a standard method. The continuation of the existing practice of measuring the span of buildings to the outside faces of columns (bay spacing to centre lines of columns) has obvious advantages in

that it makes it easy to marry, dimensionally, buildings of dissimilar construction. In the establishment of the horizontal dimension, however, it was felt that allowance was necessary for the inward projection of structural members.

The preferred bay spacing is influenced by rigid sheet sizes as well as the functional and practical examination of the existing 15 and 20 ft bays. For the smaller industrialized buildings, where sheets are used lengthways for cladding and lining, a 3,000 mm spacing has regard to the length of rigid sheet while 6,000 mm is the rationalized metric equivalent of 20 feet. However, the preference for 4,800 mm (16 ft) in place of the present 15 ft is in the belief that:

1. the reduction from 15 ft to 14 ft 9½ in. which would be the effect of adopting a spacing of 4,500 mm would impose too severe a limitation on buildings in the future because already there is evidence that the 15 ft bay is proving slightly too narrow;
2. there would be no economic saving comparable to the 1·6 per cent reduction of length, especially for framed buildings where columns and foundations are unlikely to be reduced;
3. greatest advantage of rigid sheet materials can be made by multiples of their 1,200 mm maximum width;
4. the acceptance of 1,200 mm as a 'good dimension' seems general in the construction industry.

It proved more difficult to establish a range of heights where height limitations are not so definable. Generally, however, acknowledgement of the 300 mm module, or multiples thereof, would seem to be the only criteria, although it would be necessary to make an allowance for height in buildings likely to be entered by tractors fitted with a cab and for the unimpeded use of other vehicles servicing the buildings.

As with width, it is necessary to establish the controlling lines, or upper and lower limits of height. For the lower plane of reference it is suggested that it be floor level or where there is no formed floor, highest ground level; the upper plane would be through its intersection of the roof structural zone (i.e., the top of the purlins or equivalent structural members), either horizontal or inclined, and the external face of the vertical structural zone. In practice, this would normally be the underside of the roof sheeting immediately above the outer face of column or wall.

Choice for the upper limit fell between this and the alternative of clear internal height, but the argument for easy marrying of buildings, as applied to width, and the relationship of the external dimension to cladding components which will conform to dimensional co-ordination favoured this decision.

The change to metric and technological advances will, in due course, demand a new range of British Standards and no doubt there will be a need for one to cover all agricultural and horticultural buildings. It is conceivable that dimensional guidance will need to be an aspect of such a document. In any case the overall dimensional pattern for agricultural buildings must be established if the economic advantages of industrialization are to be achieved. It is hoped that the recommendations discussed in this article, which in a future issue of *Agriculture* will be illustrated by diagrams showing preferred dimensions for farm buildings, will serve as a basis for the guidance needed. In the meantime, if the recommendations are, wherever practicable, adopted by designers, an experience of constructive criticism should result to the benefit of the industries concerned.

in brief

- **Plant science and food production**
- **Lowland sheep: Rosemaund experiment**
- **Imber: a new barley for brewing**
- **Nitrogen by injection**

Plant science and food production

The gap between pure and applied science which persisted for the greater part of a hundred years has only comparatively recently begun to narrow. The plant sciences, and in particular the once-regarded 'genteel study' of botany, are a case in point. But national and global problems pivoting on changed economic concepts and the foreseeable need to meet the food requirements of proliferating populations have injected a new urgency into our thinking. Hence the stimulus to technological innovation in agriculture which continues to proceed from strength to strength, often under the influence of its own momentum.

The important role which the modern plant physiologist has to play in future agricultural productivity was the subject of Professor P. F. Wareing's address to the British Association meeting in Durham this year. Earlier, largely empirical methods directed to increasing crop yields, whether by cultural practices or by breeding, have now been overtaken by intensive efforts to identify those inherent characteristics of the individual plant and of the crop which limit their productivity and to examine cultural practices from the standpoint of more fundamental principles. Thus plant breeding has progressed to a more critical stage, in which not only the usable part of the plant (e.g., the ears of cereals) but the photosynthetic activity of the whole plant comes under scrutiny. For example, wheat is less productive than sugar beet, kale or grass; the grain is produced by photosynthesis in only a small fraction of the total leaf tissue over a mere six weeks from the time of flowering. From the viewpoint of man's economic needs, this is a physiological defect, and although partly corrected in some of the more recent varieties, this field offers a potentially valuable area of continued investigation whereby food resources could be increased.

Taking wheat as an obviously important example to illustrate his theme, Professor Wareing pointed to several possibilities that seem to exist for improving the circumstances of the grain-filling period: (1) by delaying the ageing of the flag leaf and so extending the period of photosynthesis (the high yields of Proctor barley are partly attributable to this manipulation); (2) by developing awns on the European varieties of wheat, so enabling the grain to draw on extra nutriment by additional photosynthesis at the material time; and (3) the breeding of varieties in which a greater part of the plant contributes more nourishment to the grain. Competition for carbohydrates between the stems and what are called the ear primordia may also be reduced by breeding for shorter stems—a physiological characteristic associated with the higher yields of the new Mexican semi-dwarf wheats. And yet another area of investigation is the reduction of non-fertile tiller growth, leading to C. M. Donald's suggestion of breeding wheats which have only a single stem—along the lines of single tiller genotypes of barley bred and currently under test at Aberystwyth.

'Traditional breeding methods have been very successful,' Professor Wareing said, 'but we may reasonably expect that progress will be more rapid if we can identify the characters leading to high yield and deliberately bring them together, rather than depend upon random favourable genetic combinations. Clearly this approach will require close collaboration between breeders, physiologists and biochemists. Plant physiologists have an essentially practical contribution to make in the advance of farming technology,' in the author's own words, 'at least as important as space research.'

Lowland sheep: Rosemaund experiment

Five years experience of intensively kept sheep at Rosemaund Experimental Husbandry Farm suggests a paying proposition on lowland farms. The system rests on the maximum use of grass, managed over six paddocks. Of the various levels of nitrogen treatments tried, that using 90 units N spread over three applications appears to have given the most satisfactory result, sufficient to maintain six Welsh Half-bred ewes and their lambs throughout the grazing season and in addition providing a silage cut for the winter feeding of the ewes. Cheap winter housing in pole barns has kept up the stocking rate over the whole year. During the five years of experimentation about 75 per cent of the lambs have been sold fat off grass by September, making an average of £6 10*s*. each, which indicates that sheep as a break crop kept under similar conditions is well worth thinking about.

Imber: a new barley for brewing

Proctor barley, which has long led the field, has 'sired' its own rival in the form of the new malting barley *Imber*, one of a number of varieties coming to the fore. This new spring variety has been bred from a cross between Proctor and Elsa at the Guinness Warminster research station and launched jointly with Ranks Hovis McDougall. Trials by the Ministry of Agriculture, Fisheries and Food and the N.I.A.B. at over forty centres during the past three years have shown it to be superior to Proctor, both in yield and malting qualities. It is claimed that it matures earlier and is stiffer strawed, and it seems, too, that it is likely to stand up well to difficult weather conditions which all too often assail the crop at harvesting time. From the foliar disease angle it has a good tolerance to mildew and rhynchosporium.

Nitrogen by injection

The practice of putting *in* nitrogen instead of putting it *on* appears to be gaining ground. For farmers other than those in a big way of business and so likely to be able to afford—and justify—the equipment and ancillaries required, this is a contractor's job. The machine, tractor-mounted, injects ammonia under pressure into the soil to an adjustable depth of 4—6 inches, according to whether the soil is heavy or light. The ammonia is converted into nitrate by the action of soil bacteria when the temperature of the soil rises above 4·5°C.

One advantage asserted for this method of application over the traditional 'out-of-the-bag' dressings is that the nitrogen is placed immediately at root level. A distinct advantage on grassland is that the injections can proceed without first having to take grazing animals off the field. About 230 units would be the common economic dose which, by a single application to grass, is said to be sufficient for a period of three or four months grazing.

AGRIC.

Books

Trace Elements in Agriculture. VINCENT SAUCHELLI. D. Van Nostrand Co. Ltd., 1970. £7.

This American book is a straightforward account of the role of trace elements in plant nutrition, symptoms of their deficiencies and methods used in the diagnosis and correction of those deficiencies. The author, admitting himself in the preface to be a compiler rather than a researcher, has produced a very readable review of the subject and is generous with his sources at the foot of each relevant page and also at the end of each chapter. A general bibliography is also given.

Each trace element is discussed in relation to its chemical properties, its reactions in the soil and in the plant, the symptoms of its deficiency in plants, and corrective treatment. Toxicity effects produced by over-correction of the deficiencies are mentioned and the effects of the grazing by livestock of pastures whose soils contain high levels of naturally occurring molybdenum and selenium are also included. The addition of trace elements to fertilizers and the difficulties that this presents are discussed and mention is also made of the determination of metallic trace elements by atomic absorption methods. Some useful information on the range of trace element contents of plants, summaries of deficiency symptoms and methods of treatment, including rates of application of corrective materials, are scattered in tables throughout the book.

The author quotes much data on the trace element content of soils but, unfortunately, these are of only limited use as he omits to say whether the values given represent the total content or some extractable fraction and to give the extractant used.

The book is easy to read and does not go too deeply into the subject. Its chapters are subdivided with frequent headings and particular aspects of a subject are easy to find. It contains much useful information and should prove useful to the more progressive farmers and horticulturalists, general advisers in crop production and animal husbandry, students and the reader wishing to keep abreast of developments in the subject.

R.R.C.

Walmesley's Agricultural Arbitrations. (3rd edition). F. W. ALLAM and D. H. CHAPMAN. The Estates Gazette Ltd., 1970. 42*s*. [£2·10].

Since it was first published in 1952 this book has been the recognized guide to the subject. It both serves as a text book for those who want to pass examinations and is also a very straightforward reference book for the agricultural surveyor who only occasionally becomes involved in an arbitration. Indeed, amongst those surveyors who regularly appear before an arbitrator, there are some who would make less mistakes if they studied this small book. Is it possible, too, that there are arbitrators who could profit from its wisdom?

There need be no sense of shame in admitting to the need to refer to such an eminent authority as Charles Walmesley but since his preferment to membership of the Lands Tribunal he has been unable to continue his professional writing. In consequence, this up-dated edition—the second edition was published in 1959—has been revised by F. W. Allam and D. H. Chapman. This partnership of long practical experience and brilliant academic ability has ensured the maintenance of a very high standard.

The edition covers the developments in both statute and case law during the last decade. For instance, the added problems for the arbitrator who must give reasons for his award, and the crop of cases which resulted, are dealt with. So, too, is the arbitration on notices to quit for unremedied breaches, a matter which can demand some very difficult judgments. An interesting opinion on the use of comparables in rental arbitrations suggests that the opinion of an expert witness on a certain 'tone' of rental value for an estate should be accepted by the arbitrator without the need to inspect the whole estate. I have myself maintained this in the past, but it has not gone without challenge. Yes, for the sake of 210p, rural practitioners would be well advised to replace their old copies with the latest edition of this handbook to agricultural arbitration

J.D.F.

History from the Farm. W. G. HOSKINS. Faber and Faber, 1970. 50*s*. [£2·50].

Sixteen of the eighteen essays in this book owe their origin to a competition for the best farm history, arranged by the *Farmers Weekly*.

To judge from the entries it seems that farmers in the pastoral north-west tend to take a keener interest in the history of their farms than do the arable farmers of the south. Many of the prize winning entries speak of pains taking research into ancient farm inventories and local records.

Professor Hoskins prefaces each essay with a note drawing attention to special points of interpretation in the light of his own wide knowledge of farm archaeology. Reference is made to the value of aerial photographs in delineating ancient farm boundaries and even the sites of long vanished villages. Several of the essays draw attention to the use of hedge, tree and shrub counts. A hedge bearing eight different species betokens an age of 800 years, one bearing nine 900 years, and so on. This theory appears to hold good for some but not all farms.

The essays contain much material bearing on social and political changes down the centuries. Pastoral farms tend to be isolated whereas lowland arable farms originally formed part of villages because of the need to share capital resource (e.g., oxen teams) and to ensure labourers for tillage and harvesting.

There is a great paucity of data on farm archaeology and much remains to be discovered. The book should be a stimulant to further work in this little known field.

A.J.L.L.

Introduction to Crop Husbandry. J. A. R. LOCKHART and A. J. L. WISEMAN. Pergamon Press Ltd., 1970. Hard cover 50*s*. [£2·50], flexi-cover 37*s*. [£1·85].

How many years yet will it be before arable farmers, advisers, students etc. can think meaningfully about sowing 125–150 kg/ha of barley at 50 mm deep, apply 50–100 kg/ha of fertilizer and hope to harvest 4·5 tonnes/ha, which should not be heated above a following maximum temperature of 82°C if the grain is for stock-feeding and if possible it should ideally be cooled to 18°C for storage. Alternatively, if the grain is to be stored damp, 5–9 litres of propionic acid per tonne of grain can be used.

This book makes readers squarely face the fresh challenge of agriculture going metric, by converting all our inherited traditional crop husbandry concepts such as seed rate, fertilizer levels, yields etc. into the new terminology. In most cases the current conversion is simultaneously listed but in a few instances metric measurements are assumed to be grasped already.

In such a book which is packed tight with information, the style of writing has of necessity to be rather telegrammatic, and there are few wasted words and virtually no padding. It is well printed with clear diagrams, simple to follow and has a natural sequence from basic knowledge of plants, through soils, fertilizers, husbandry considerations, weeds and diseases. The book is hardly a delight to read but covers most facets of crop husbandry, dealing so succinctly with practical aspects of individual crop production that it should be in keen demand by many students and be a useful *vade mecum* with a wider audience.

D.W.B.

books received

National Institute of Agricultural Engineering Report for the period 1 April 1967 to 31 March 1970. 20*s*.

Farms in Britain. Raymond Johnson. Macmillan and Co. Ltd., 1970. 11*s*.

The Role of Nitrogen in Grassland Productivity. A review of information from temperate regions. D. C. Whitehead. Commonwealth Agricultural Bureaux, 1970. 45*s*.

Farming and Wildlife. A study in compromise. Edited by Derek Barber. Copies from The Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire. 1970. 10*s*. incl. postage.

Forestry Commission Fiftieth Annual Report and Accounts 1969–70. H.M.S.O., 1970. 14*s*.

Optimum Harvesting Systems for Cereals. An Assessment for South-East England. G. F. Donaldson. Copies from Publications Dept., School of Economics and Related Studies, Wye College, Nr. Ashford, Kent. 1970. 20*s*. post free.

Careers for Girls in Agriculture and Horticulture. Third Edition. Copies from The Women's Farm and Garden Assoc. (Inc.), Courtauld House, Byng Place, London, W.C.1. 1970. 3*s*. 6*d*. plus 6*d*. postage.

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Liquid Formulations
Betafen—Boots

Company Information

The names of the following firms have been changed but their addresses remain unaltered.

Baywood Chemicals Ltd. have become *Bayer Agrochem Ltd.*

Mi-dox Ltd. have become *Duphar-Midox Ltd.*

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